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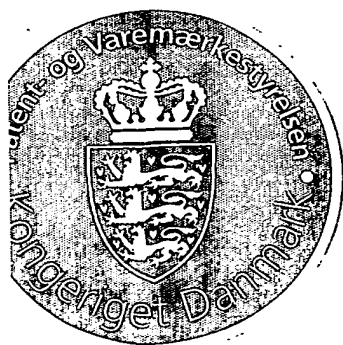
# Kongeriget Danmark

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Title: Lyseslukker og fremgangsmåde til fremstilling af samme

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Patent- og Varemærkestyrelsen  
Økonomi- og Erhvervsministeriet

04 November 2004

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Modtaget

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The present invention relates to a candle extinguisher comprising a unitary body of a thin plate material and made from a non-combustible or non-inflammable material, i.e. material which is not caused to burn, melt or otherwise be deteriorated when contacted with the burning flame of a candle or when exposed to the heat generated by the burning flame of a candle.

For centuries, a candle extinguisher has been used, which candle extinguisher is made from a conical metal cup having a rod constituting a handle by means of which the cup is positioned in an inverted state on the top of a candle for extinguishing the candle by preventing oxygen from being admitted to the burning candle.

The technique of extinguishing a burning candle has also been refined throughout several decades as candle extinguishers have been developed as described in, among others, DE 177488, DE 162195, US 4818214 and WO 02057688. Reference is made to the above publications and the above US patent is hereby incorporated in the present specification by reference.

Common to these prior art candle extinguishers is the technical functionality of the extinguishers as the extinguishers have been developed for providing an automated functionality similar to the above-described candle extinguisher as the candle extinguishers described in the above publications are based on the technique of extinguishing a burning candle by closing off a compartment in which the burning flame is enclosed for causing the flame to be extinguished by the prevention of admission of oxygen to the burning flame.

The inventor has through certain test of thin plate candle extinguishers to some extent resembling the candle extinguishers described in the above-mentioned publications realised that an improvement of the automated candle extinguishing technique may be developed provided a different approach of causing the candle to be extinguished be deduced.

It is an object of the present invention to provide a candle extinguisher being made preferably in a unitary structure from a lightweight and inexpensive flame resistant material such as carbon steel or stainless steel plate which candle extinguisher provides a reliable extinguishing of a burning candle eliminating the risk of not  
5 extinguishing the burning candle as is the case with the prior art candle extinguishers, which do not function provided oxygen be admitted to the closing off chamber in which the burning flame is enclosed. A risk exists in the prior art technique as a mechanical deterioration of the candle extinguisher or an extremely long burning flame may prevent the candle extinguisher from operating properly  
10 meaning that the candle continues to burn although the candle extinguisher be positioned correctly on the burning candle.

The above object together with numerous other objects, advantages and features which will be evident from the below detailed description of the presently preferred  
15 embodiments of the candle extinguisher according to the present invention are according to the teachings of the present invention obtained by a candle extinguisher comprising a unitary body of a thin-plate material, the thin-plate material being non-combustible or non-inflammable when exposed to the burning flame of a candle, the body having a ring-shaped part defining an inner space of the  
20 candle extinguisher and having an inner diameter at least slightly exceeding the outer diameter of a candle on which the candle extinguisher is to be positioned, the body having a plurality of flexible finger elements extending upwardly from said ring-shaped part, each of the flexible finger elements comprising a proximal part and a distal part, the proximal parts extending substantially in coplanar relationship with  
25 the ring-shaped part and being bendable from the coplanar relation outwardly relative to the inner space defined by the ring-shaped part, each of the distal parts being bent substantially perpendicularly relative to a respective proximal part and extending inwardly relative to the inner space defined by the ring-shaped part, each of the distal parts having a length at least exceeding one half of the width of the  
30 inner space defined by the ring-shaped part.

According to the teachings of the present invention, the candle extinguisher is of a structure different from the structure of the prior art candle extinguishers and further

has a functionality different from the functionality of the prior art candle extinguishers. The candle extinguishers according to the present invention functions as follows.

5 The candle extinguisher is before the lightning of a candle positioned at a certain level or height above the supporting candle holder or a supporting surface such as a supporting table. The position corresponds to the height at which the candle is intended to be extinguished.

10 By the positioning of the candle extinguisher on the candle, the finger elements are bent outwardly as the proximal parts extend outwardly and as the outermost ends of the distal parts contact the outer circumference of the candle. Basically the candle, when positioned on a candle resembles a lightrosette. However, at the time of extinguishing the candle, at which time the candle has burned away until the level  
15 corresponding to the position of the upper end of the candle extinguisher, the distal parts of the finger elements are pressed into contact with the outer surface of the wick of the candle at a position below the burning flame.

20 The process of contacting the outer ends of the distal parts of the finger elements with the outer surface of the wick is a process in which the flexibility of the finger elements causes the distal parts to move from the contact with the outer surface of the candle into contact with the outer surface of the wick as the material of the candle is burned away and eventually, the outer ends of the distal parts of the finger elements tightly contacts the outer surface of the wick and closes off any space  
25 around the wick and in doing so prevents the wick from transporting melted and combustible stearin or similar materials such as wax from the candle to the burning wick constituting the flame of the candle. As will be understood, the turning off or extinguishing of the candle by the candle extinguisher according to the present invention is a technique involving tightly closing off the top part of the wick which  
30 burns in the flame from the reservoir below the candle extinguisher.

According to the teachings of the present invention, the distal parts must have a length allowing the outer ends of the distal parts to be tightly pressed against the

outer surface of the wick for closing off the burning part of the wick from the remaining part of the candle and this closing off is established provided the distal parts have a length at least exceeding one half of the width of the inner space defined by the ring-shaped part. Normally, the ring-shaped part has a circular cylindrical part and the half width of the inner space defined by the ring-shaped part consequently corresponds to the radius of the circular cylindrical part.

The candle extinguisher according to the present invention is preferably made as a unitary structure from a single thin plate material as the ring-shaped part and the flexible finger elements comprising the proximal parts and the distal parts are preferably made from one and the same flexible thin plate material such as carbon steel or stainless steel or a high temperature resistant plastics material or another metal material such as titanium, aluminium, copper, silver, gold or platinum or alloys thereof such as noble or semi-noble alloys. The thin plate material is preferably of a thickness of 50-500 $\mu$ m, preferably approximately 100-150 $\mu$ m for allowing the proximal parts of the finger elements to be easily bent outwardly when positioning the candle extinguisher on the candle for the intentional use of the candle extinguisher.

In order to obtain an adequate flexibility of the proximal parts of the finger elements, each of the proximal parts preferably have a length at least exceeding the lengths of the distal parts such as preferably a length corresponding to approximately two times the length of the distal parts or even more.

The proximal parts of the finger elements of the candle extinguisher according to the present invention may have any appropriate size and configuration and may e.g. be configured as thin plate elements or alternatively as rectangular plate elements in combination defining a circumference substantially corresponding to the circumference of the ring-shaped part. According to the presently preferred embodiment of the candle extinguisher according to the present invention, the proximal parts are substantially of a rectangular configuration and the width of each of the proximal parts are at the most one half the length of the proximal part for providing a fairly easily flexible proximal part.

The distal parts exhibit as discussed above the feature characteristic of the present invention of defining a length at least exceeding one half the width of the inner space defined by the ring-shaped part. When fulfilling this feature, the distal parts may have any appropriate shape such as a rectangular, a semi-elliptical or other shape or a combination thereof. However, according to the presently preferred embodiment of the candle extinguisher according to the present invention, the distal parts preferably have a shape substantially of an isosceles triangle, the base line of which is congruent with the outermost end of the respective proximal part, thereby providing a straight continuation of the proximal part.

Dependent on the size of the candle, the number of finger elements of the above-mentioned plurality of finger elements may vary from a fairly low integer to a fairly high integer such as between 3 and 30. It is contemplated that the number of finger elements may further advantageously and preferably be of the order of 5-20, such as 8-16 and according to the most preferred embodiment, the number of finger elements are 10 or 12.

The present invention also relates to a method of producing the candle extinguisher comprising a unitary body of a thin-plate material, said thin-plate material being non-combustible or non-inflammable when exposed to the burning flame of a candle, the body having a ring-shaped part defining an inner space of the candle extinguisher and having an inner diameter at least slightly exceeding the outer diameter of a candle on which the candle extinguisher is to be positioned, the body having a plurality of flexible finger elements extending upwardly from the ring-shaped part, each of the flexible finger elements comprising a proximal part and a distal part, the proximal parts extending substantially in coplanar relationship with the ring-shaped part and being bendable from said coplanar relation outwardly relative to the inner space defined by the ring-shaped part, each of the distal parts being bent substantially perpendicularly relative to a respective proximal part and extending inwardly relative to the inner space defined by the ring-shaped part, and each of the distal parts having a length at least exceeding one half of the width of the inner space defined by the ring-shaped part, the method comprising the steps of cutting a

blank from a thin-plate material, the blank including a bottom shape part constituting a web of the thin-plate material and a plurality of flexible finger elements extending to the one side from the web and including inner parts and outer parts, the step of turning the blank into a cylindrical body having the web constituting the ring-shaped part and having the inner parts constituting the proximal parts and the outer parts constituting the distal parts, and bending in a single-step operation or a multi-step operation, the distal parts perpendicularly relative to the proximal parts.

The method according to the present invention allows the production of the candle extinguisher according to the present invention in a integrated process involving the machining of a thin plate metal plate exclusively in a continuous process or an intermittent process. According to alternative embodiments of the method according to the present invention, the steps of cutting the blank from the thin plate material is performed as a roller cutting operation or alternatively as an intermittent operation involving the movement of a plunger in a reciprocating operation relative to the thin plate material and correspondingly, the step of bending the distal parts of the finger elements relative to the proximal parts of the finger elements may be performed in a single operation in which the distal parts are bent substantially perpendicular relative to the proximal parts or alternatively in a two or three step operation involving e.g. a pre-bending of the distal parts before turning the blank into the cylindrical body in an angle of approximately  $45^\circ$  and a final bending step of further bending the distal parts further  $45^\circ$  relative to the proximal parts for accomplishing the substantial perpendicular orientation of the distal parts relative to the proximal parts.

The invention is now to be further described with reference to the drawings in which:

Fig. 1 is an overall schematic, perspective and elevational view of a first and presently preferred embodiment of the candle extinguisher according to the present invention,

Fig. 2 is a view similar to the view of Fig. 1 of an alternative embodiment of the candle extinguisher according to the present invention,

Figs. 3a, 3b, 3c and 4d are schematic views illustrating a presently preferred embodiment of cutting, partly bending, rolling and bending a blank into the candle extinguisher shown in Fig. 1 and,

- 5 Figs. 4a, 4b and 4c are photographs illustrating the intentional use of the candle extinguisher illustrating the extinguishing of the candle by the separation of the flame from the remaining part of the candle without cutting of the burning wick part.

10 In Fig. 1, a first version or embodiment of a candle extinguisher according to the present invention is shown designated the reference numeral 10 in its entirety. The candle extinguisher is made from flexible thin plate material, such as carbon steel of a thickness of 150µm. The candle extinguisher is, as will be described in greater details below, produced in a punching or cutting, folding and bending operation as the candle extinguisher is produced as a unitary structure from the thin plate

15 material. As is evident from Fig. 1, the candle extinguisher 10 comprises at its bottom end a circumferential ring-shaped part 12 from which a total of 10 flexible finger elements extend upwardly, one of which finger elements is designated the reference numeral 14. The finger elements 14 basically comprise two parts, namely a proximal part integrally connected to the ring-shaped part 12 of the candle

20 extinguisher and a distal part 16, which is bent substantially perpendicularly relative to the proximal part 14. The proximal part 14 extends in coplanar relation from the ring-shaped part 14 and is separated from its adjacent or neighbouring finger element by a slot 18. The proximal parts 14 are of an overall rectangular configuration, whereas the distal parts 16 are of a triangular configuration having the

25 base line of the triangle configured congruently with the upper most end of the proximal part 14.

30 It is to be realised that the terms, such as upper, lower, bottom, top, proximal and distal as used in the present context are all to be construed in the context of the intentional use of the candle extinguisher, as the candle extinguisher is intended to be used mounted on a candle which is conventionally positioned vertically and having the ring-shaped part 12 as a lower most part of the candle extinguisher.



In Fig. 1, the technique of assembling the blank from which the candle extinguisher is produced is illustrated as the reference numerals 20 and 22 designate two thin metal plate flaps which are bent through perforations of the overlapping ring-shaped part for maintaining the ring-shaped part in the overall cylindrical or ring configuration, is illustrated in Fig. 10.

The candle extinguisher 10 may be produced in different sizes, such as a dimension corresponding to the diameter of the ring-shaped bottom part 12 ranging from 14mm-32mm, such as produced in distinct sizes 14mm, 22mm, 24mm and 32mm.

Dependent on the diametrical size of the candle extinguisher, the height of the candle extinguisher may vary from approximately 20mm-40mm, as the height of the candle extinguisher is somewhat larger than the candle extinguisher.

The slits 18 separating the finger element 14 from its adjacent or neighbouring finger element may extend to only a few mm above the lower rim of the ring-shaped part 12, as the ring-shaped part 12 merely serves the purpose of providing mechanical integrity and sufficient strength for allowing the finger elements 14 from being bent outwardly as is illustrated in Figs. 4a-4c.

The finger elements 14 are in the embodiment shown in Fig. 10 of an overall width varying from 3mm-10mm depending on the diametrical dimension of the candle extinguisher and the distal end parts 16 of the finger elements provide an overlap as is illustrated in Fig. 1 since each of the distal end parts 16 have a length exceeding the radius of the ring-shaped part 12. Preferably, the distal end parts 16 have a length exceeding the one half diameter of the ring-shaped part 12 by 1-3mm, such as 1,5-2mm.

In Fig. 2, a second or alternative embodiment of the candle extinguisher according to the present invention is shown designated the reference numeral 10' in its entirety. In Fig. 2, all elements or components serving the same purpose as elements or components, respectively, described above with reference to Fig. 1, however, differing geometrically from the above-described elements or components are designated the same reference numeral as used in Fig. 1, however added the

marking '. As is evident from Fig. 2, the second embodiment 10' differs from the first embodiment 1 basically in that the finger elements 14 have their proximal ends tapering from the lower end to the upper end for providing in the intentional use, as is illustrated in Fig. 4a, a somewhat crown-like appearance.

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In Figs. 3a, 3b, 3c and 3d, four steps of a process of producing the first and presently preferred embodiment of the candle extinguisher shown in Fig. 1 is illustrated in which first process illustrated in Fig. 3a, a blank 30 is cut or punched from a web of the thin plate material, which web is supplied from a role not shown in the drawings. The blank is punched by means of a vertically reciprocating plunger not shown in the drawings, which is moved at a high speed, such as the speed of 1000 times/min. for producing 1000 candle extinguishers per minute.

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A particular feature of the technique of producing the candle extinguisher, as is illustrated in Figs. 3a-3d relates to the utilisation of an edge band 32 from the thin plate material web and serving as a support for the individual blanks until the candle extinguisher has been finalised from the blank and also serving as a guide and propeller during the process of manufacturing the candle extinguisher.

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In Fig. 3b, the blank 30 is exposed to a bending process in which the distal parts 16 of the finger elements 14 are partly bent into an angle of approximately 45° relative to the proximal parts of the finger elements. The bending of the distal parts of the finger elements is accomplished by means of co-operating bending tools 34 and 36.

20

In Fig. 3c, the blank 30 is rolled into the circular cylindrical shape of the candle extinguisher, as due to the partial bending of the distal ends 16 of the finger elements 14, the rolling may be accomplished without causing the distal end part 16 to jam the rolling process which inevitably would have been the situation provided the distal end parts had been bent into the final perpendicular arrangement. The rolling is carried out by means of a mandrill 35 which is rotated as indicated by an arrow and a guiding tool 44.

25

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Finally, in the step illustrated in Fig. 4d, the blank rolled into the circular cylindrical shape is machined for causing the distal parts 16 of the finger elements 14 to be bent into the perpendicular position in the final product as is illustrated in Fig. 1. The bending is accomplished while the blank is fixated to the mandrill 35 and generated by means of a pressing tool 37. Finally, after the bending of the distal parts 16 into the perpendicular arrangement relative to the proximal parts of the finger elements 14, the product is cut from the supporting edge band 32.

The technique illustrated in Figs. 3a-3d may for obvious reasons be modified in numerous ways without deviating from the protective scope as defined in the appending claims. As an example, the mechanical fixation of the blank in the circular cylindrical configuration by means of the flaps 20 and 22 may be substituted by a spot-welding technique or a high frequency welding technique and the geometrical shape of the blank, as is already mentioned above, may be modified without altering the functionality of the product by the candle extinguisher.

### Example

A prototype embodiment of the candle extinguisher 10 shown in Fig. 1 and produced as illustrated in Figs. 3a-3d, was made from 150µm carbon steel plate and cut into the blank shown in Fig. 3a by means of a punching tool. The length of the blank was in total 78mm, the width of the ring-shaped part 12 was 6mm, the width of each of the finger elements 14 was 6mm and the length of the proximal parts of the finger elements were 18mm. The triangularly shaped distal parts 16 had an overall maximum length of 14mm. The product manufactured from the above 150µm carbon steel plate having the above measures was tested on several hundred candles and performed a swift and safe extinguishing of the candle.

Surprisingly, the extinguishing process turned out to be performed within only a few seconds from the time at which the distal parts 16 of the finger elements 14 were reaching above the edge of the candle until the outermost end of the distal parts 16 had separated the upper burning wick, i.e. the flame from the remaining part of the candle without cutting off the wick, still preventing any combustible wax or

stearinous material from being sucked into the burning flame. The photographs of Figs. 4a-4c illustrating the extinguishing process correspondingly represent a period of time of mere 5-10 sec.

5 Although the present invention has been described above with reference to specific and presently preferred embodiments of the candle extinguisher according to the present invention and according to a method also constituting part of the present invention, the candle extinguisher and a method of producing a candle extinguisher  
10 may be modified in numerous ways as will be evident to a person having ordinary skill in the art without deviating from the scope and intention of the invention as defined in the appending claims.

15

**CLAIMS**

1. A candle extinguisher comprising a unitary body of a thin-plate material, said thin-plate material being non-combustible or non-inflammable when exposed to the burning flame of a candle,  
 said body having a ring-shaped part defining an inner space of said candle extinguisher and having an inner diameter at least slightly exceeding the outer diameter of a candle on which the candle extinguisher is to be positioned,  
 said body having a plurality of flexible finger elements extending upwardly from said ring-shaped part, each of said flexible finger elements comprising a proximal part and a distal part,  
 said proximal parts extending substantially in coplanar relationship with said ring-shaped part and being bendable from said coplanar relation outwardly relative to said inner space defined by said ring-shaped part,  
 each of said distal parts being bent substantially perpendicularly relative to a respective proximal part and extending inwardly relative to said inner space defined by said ring-shaped part,  
 each of said distal parts having a length at least exceeding one half of the width of said inner space defined by said ring-shaped part.

2. The candle extinguisher according to claim 1, said ring-shaped part and said flexible finger elements being made from one and the same flexible thin-plate material, preferably carbon steel such as carbon steel of a thickness of 50 $\mu$ -500 $\mu$ , preferably approximately 100-150 $\mu$ .

3. The candle extinguisher according to any of the claims 1 or 2, each of said proximal parts having a length at least exceeding the length of said distal parts, preferably being approximately 2 x the length of said distal parts.

4. The candle extinguisher according to any of the claims 1-3, said proximal parts having substantially a rectangular configuration, the width of each of said proximal parts being at the most one half the length of said proximal part.

5. The candle extinguisher according to any of the claims 1-4, each of said distal parts having the shape of an isosceles triangle, the base line of which is congruent with the outermost end of the respective proximal part.

5 6. The candle extinguisher according to any of the claims 1-5, said plurality being at least 3 and the most 30, such as 5-20, preferably 8-15, e.g. and most preferably 10-12.

10 7. A method of producing a candle extinguisher comprising a unitary body of a thin-plate material, said thin-plate material being non-combustible or non-inflammable when exposed to the burning flame of a candle,  
 said body having a ring-shaped part defining an inner space of said candle extinguisher and having an inner diameter at least slightly exceeding the outer diameter of a candle on which the candle extinguisher is to be positioned,  
 15 said body having a plurality of flexible finger elements extending upwardly from said ring-shaped part, each of said flexible finger elements comprising a proximal part and a distal part,  
 said proximal parts extending substantially in coplanar relationship with said ring-shaped part and being bendable from said coplanar relation outwardly relative to  
 20 said inner space defined by said ring-shaped part,  
 each of said distal parts being bent substantially perpendicularly relative to a respective proximal part and extending inwardly relative to said inner space defined by said ring-shaped part, and  
 each of said distal parts having a length at least exceeding one half of the width of  
 25 said inner space defined by said ring-shaped part,  
 said method comprising the steps of cutting a blank from a thin-plate material, said blank including a bottom shape part constituting a web of said thin-plate material and a plurality of flexible finger elements extending to the one side from said web and including inner parts and outer parts, the step of turning said blank into a  
 30 cylindrical body having said web constituting said ring-shaped part and having said inner parts constituting said proximal parts and said outer parts constituting said distal parts, and bending in a single-step operation or a multi-step operation, said distal parts perpendicularly relative to said proximal parts.

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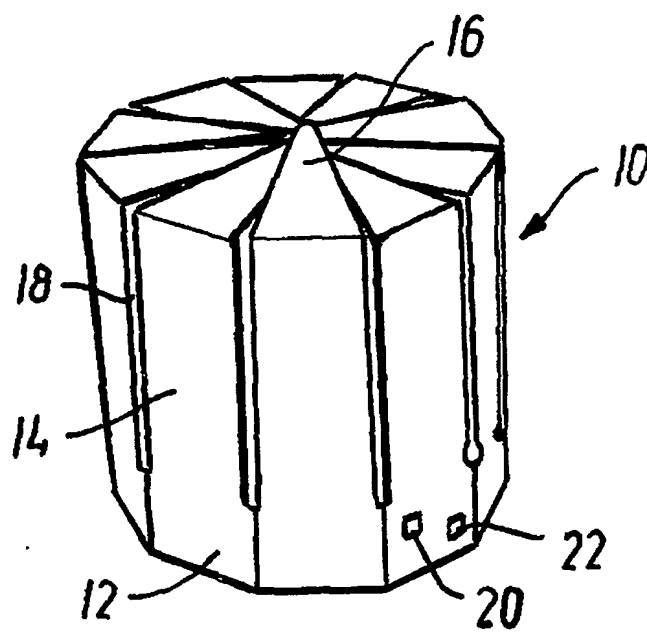


Fig. 1

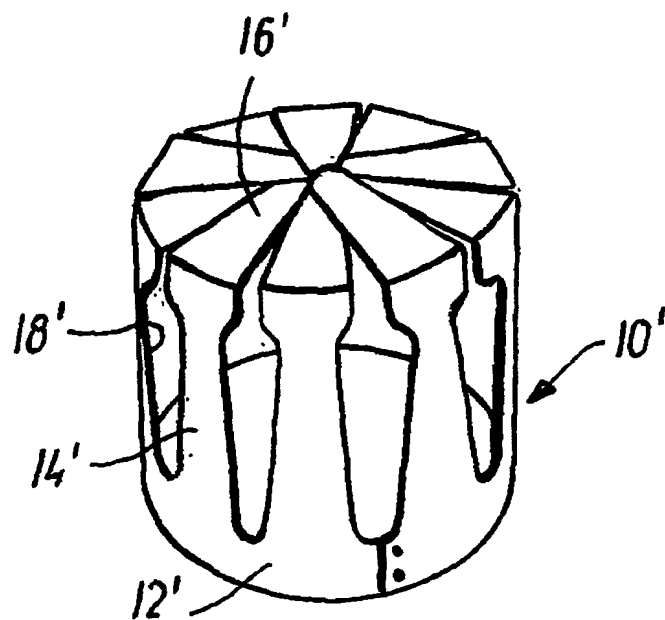


Fig. 2

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Varemærkestyrelsen  
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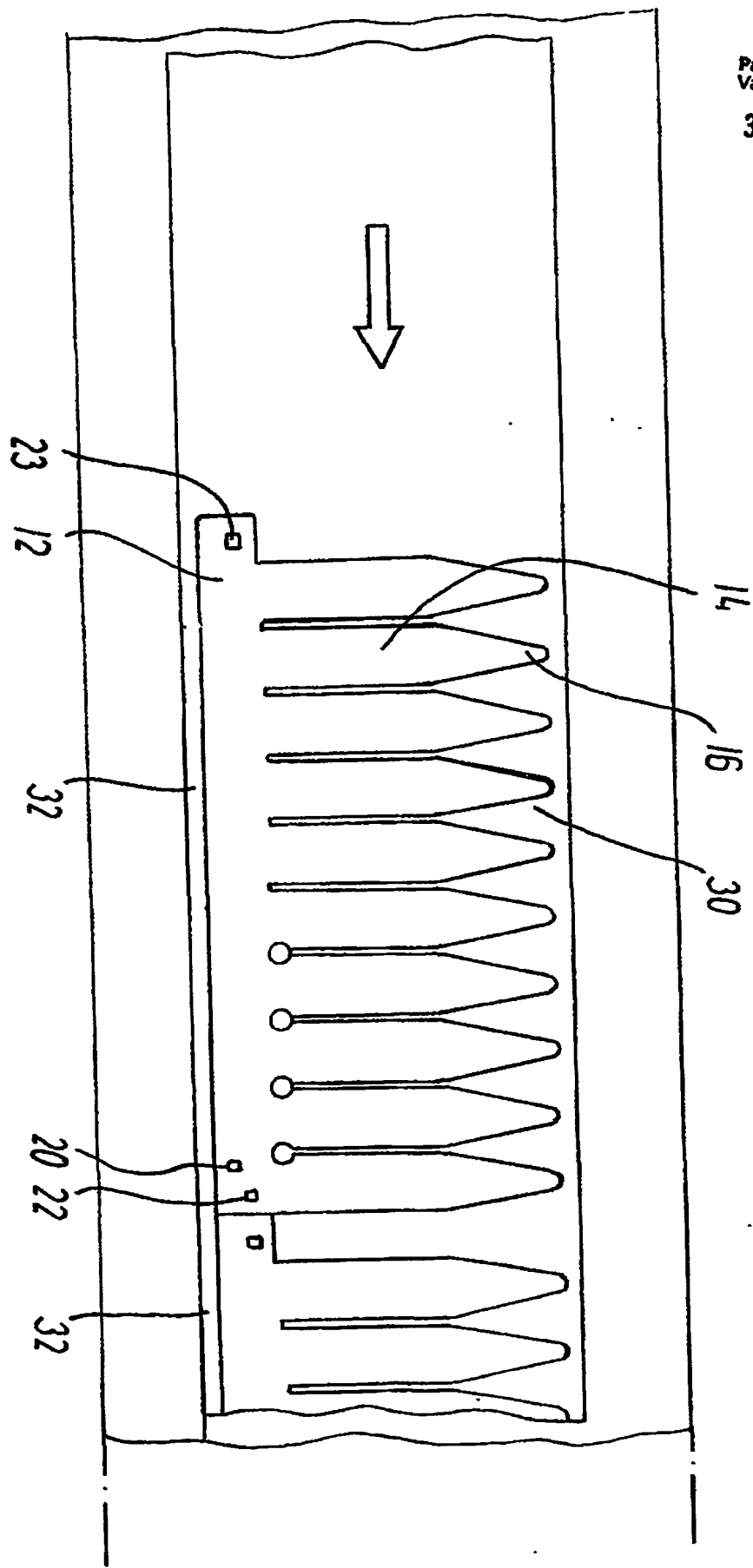


Fig. 3a



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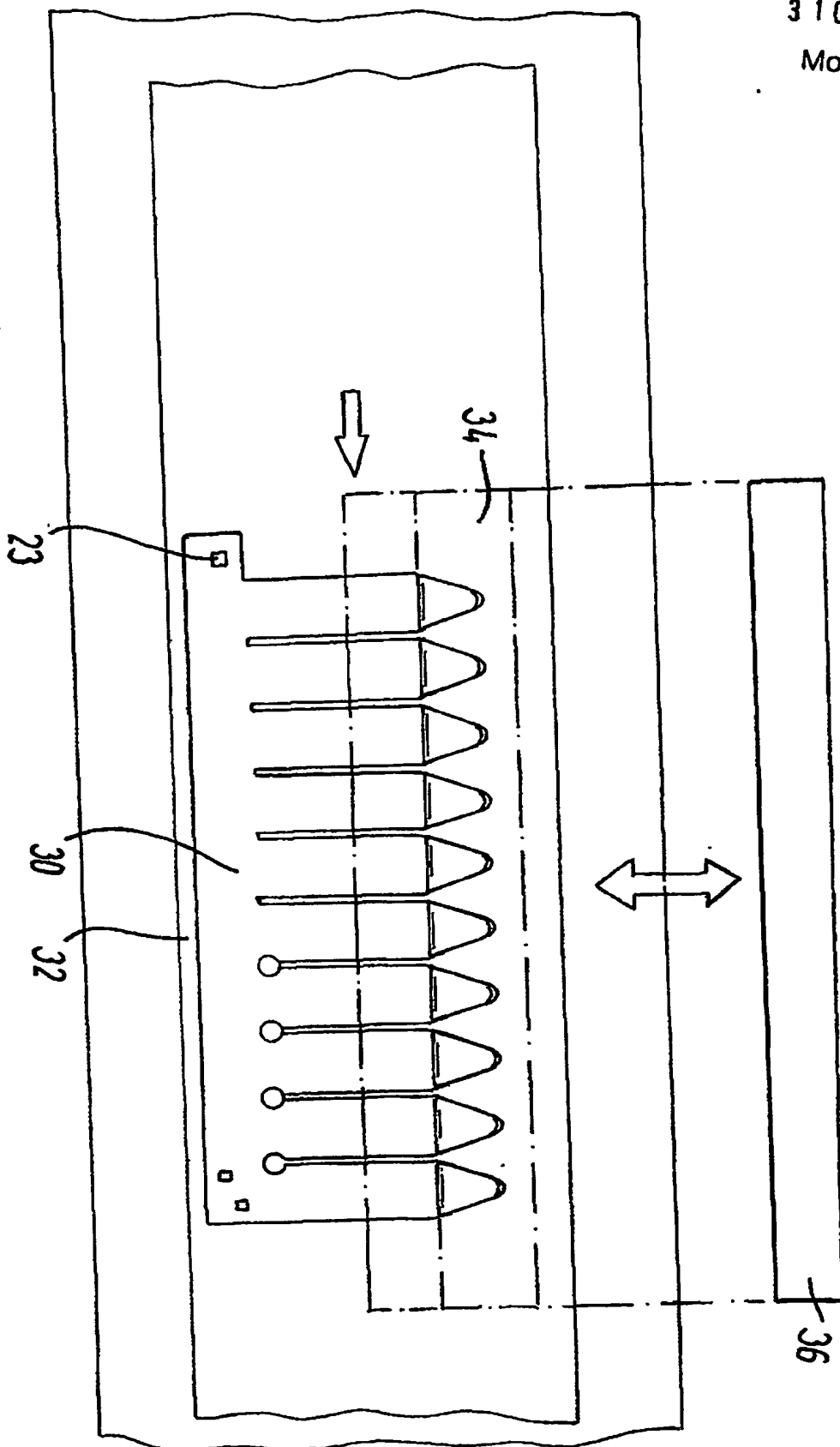


Fig. 3b

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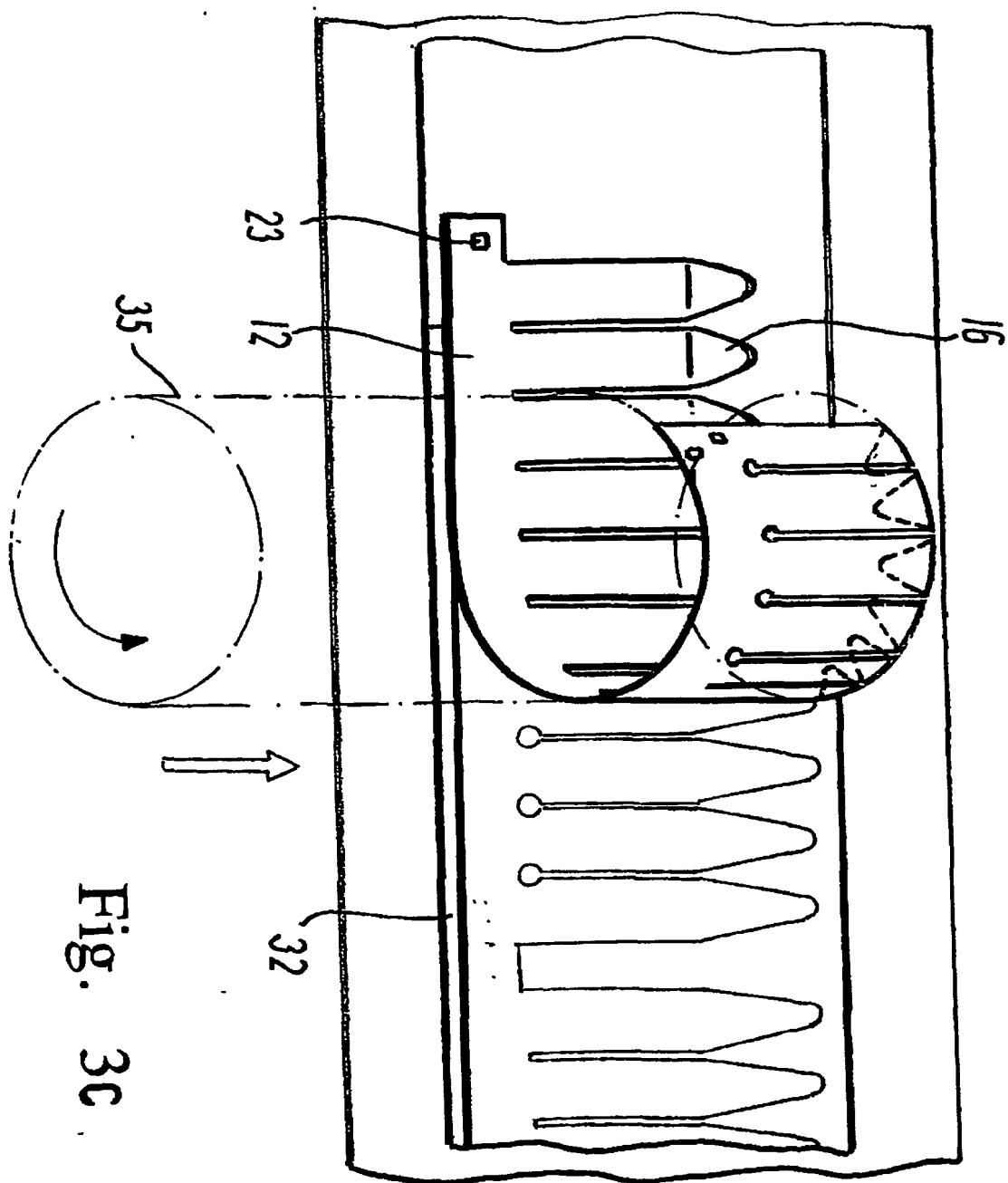


Fig. 3c

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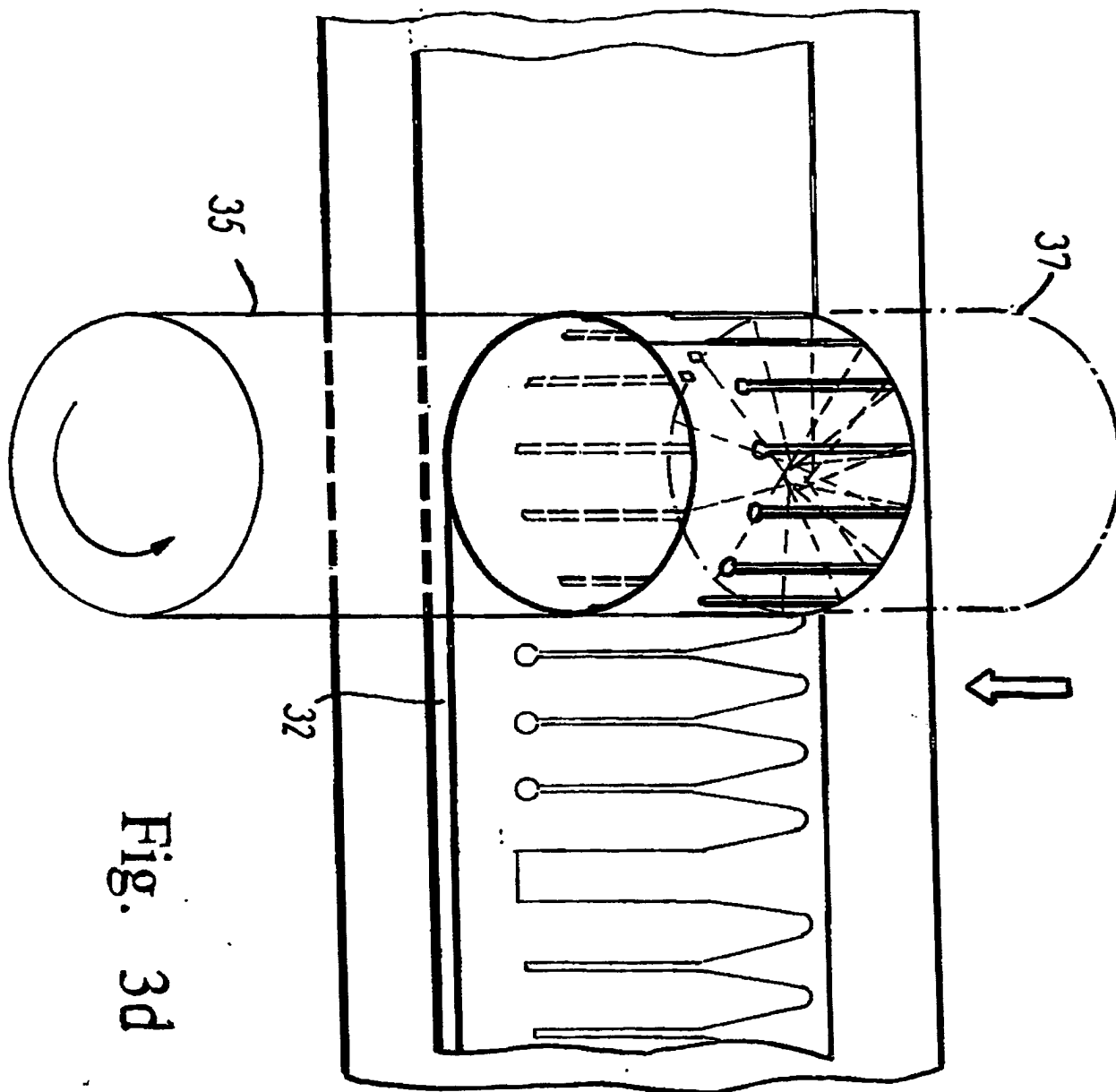


Fig. 3d

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4 A



4 B



4 C